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ABSTRACT

At the 1976 annual meeting of the AATG, a workshop session on computer-aided language instruction (CALI) was held. Hands-on experience was the primary purpose of the session; but essential to such involvement were presentations of the various modes of CALI and discussion of the accomplishments to be expected and the caveats. A fully developed language course component, "Programmed-German," developed by and used at the University of Minnesota for students throughout the state was discussed, as were the computer techniques individual instructors may develop for their specific teaching needs. (Author/CFM)

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COMPUTER ASSISTANCE IN FOREIGN LANGUAGE INSTRUCTION: PROBLEMS, POSSIBILITIES AND PAYOFFS

(Workshop session given at the American Association of Teachers of German annual meeting in August 1976)

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At the 1976 annual meeting of the AATG, the authors directed an afternoon workshop session on computer-aided language instruction (CALI). Hands-on experience was the primary purpose of the session; but essential to such involvement were presentations of the various modes of CALI, discussion of the accomplishments to be expected and a candid exposure of the cavéats. Via telephone hookups, participants were able to access two computer systems by using cathode-ray terminals (CRT)--typewriter devices with television display screens which show both what the user writes and what the computer responds. The following two parts of this paper present different approaches currently employed in CALI. The first describes a fully developed, language course component developed by and used at the University of Minnesota for students throughout the state. The second section details the computer techniques an individual instructor may develop for his specific teaching needs.

I.

In June 1972, the prestigious Carnegie Commission on Higher Education issued a report with recommendations on instructional use of technology. It was immodestly entitled The Fourth Revolution. In spite of the slow impact technology had been making upon instruction, the commission opined optimistically that by the year 2000, "...instruction...on campus may be carried on through informational technology--perhaps in a range of 10 to 20 percent" (New York: McGraw-Hall, June 1972, p. 1). Computer-aided instruction (CAI) remains one of the problem areas in higher education in the United States even after more than a decade of fairly intensive effort and sizeable investment. The headline article for 26 April 1976, of The Chronicle of Higher Education reads: "Computerized Education: Time to Sink or Swim--so says N.S.F., which has invested over $14-million in two teaching systems." It is a bit ironic that anyone should still doubt the computer's use in higher instruction. But still today only a small minority of all undergraduates have had hands-on computer experience before they graduate--and this in a society where many a salesman on the road uses a portable terminal to call in orders at the end of the day; in a society where every supermarket item is computer-coded for stocking and inventory!

Foreign-language instruction first seemed one of the promising areas for CAI because of the structured, programable, cumulative nature of the traditional beginning language sequence. Consequently, a number of rudimentary to very detailed programs have been developed over the years. However, a variety of problems--human, technolog-

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ical and economic--have prevented the programs from being extensively employed and from being rigidly tested in control situations. Recent literature has even suggested that the computer applications to language learning developed thus far be abandoned in favor of more sophisticated CALI programs that utilize fully the interactive capabilities of the computer [vide: Nelson, Ward, Desch & Kaplow, "Two New Strategies for Computer-Assisted Language Instruction," FLAnnals, 9/1 (February 1976), pp. 28-37]. Our experience in using the German course described below and in developing a universal Spanish grammar program is that failures of CALI result not so much from the underutilization of technology as they stem from the need, first of all, to convince instructors and institutions that beyond gimmickery there is something positive to be gained from CALI. Individuals need to be cajoled into employing the computer prudently and judiciously where it can be most effective. The computer, in our experience, is just a tool along with instructors, texts, tapes, blackboards, handouts, classmates, etc., that can be used to elucidate, and to facilitate the learning of a foreign language. In using the computer, instructors, in turn, gain new insights and acquire new techniques in language teaching. The man-machine interaction is profitable not just for the student but also for the course instructor, developer or manager as well.

Since 1972, a section of beginning German on the Duluth Campus of the University of Minnesota has been using a CALI component developed on the Twin Cities Campus by Professor Cecil Wood and modified after his untimely death by junior colleagues. The original intent of the Duluth project was to test whether or not a fairly detailed computer program in German could be used by a class and an instructor who knew nothing of computers and were some 150 miles away from the computer, the technicians and the mother hen attention of the course developers. Three elements of the package of materials in Wood's Programmed German, the text, the audio cassettes and the computer drill program were selected. The instructor in regular classroom sessions still offered grammar explanations and acted as coach for reading and conversation.

Programmed German, like any other beginning text, presents in orderly progression the total structures of German. It contains the two most manageable elements of language, vocabulary and grammatical structures. In the era of post transformational linguistics, it is clear that the ability to manipulate these elements is not yet language, but such skills remain basic. The grammar explanations in the text are deliberately minimal and schematic since the authors recognize that it is the nature of a teacher to elaborate adequately for a given class. The book varies most radically from traditional texts in not having a story line or reading selections with vocabulary lists. Original or graded materials in the target language are to be selected by the instructor. The second big difference is that the text (and computer drills) cover the totality of German structure twice rather than once in the course of the year. The use of the computer element with the concomitant deemphasis of class-

room drill have led the developers to realize that twice through structure quickly is better than once through ploddingly.

The limited scope of the text makes it apparent to the student that mere mastery of a book's contents will not give him genuine, even rudimentary control of German; the instructor and the classroom, the teaching phase, are essential. On the other hand, it is equally clear to the student that the learning phase, his own task which cannot be done for him, consists primarily in his assimilating grammar and vocabulary. These are the aspects of the program where individualized instruction is most appropriate. Two components of the course, the audio cassettes and the computer program, stress the need for personal effort on the part of the student. The computer program as well as the cassettes consist of the grammar drills in each chapter. Technology, in other words, is available to the student in the learning phase--in the primary individualized aspect of the course. Technology has undeniably contributed to improved language learning but is often resisted by teachers. An observation by George Lehmann in regard to language theory reminds us why machines have intruded upon language teaching: "It is not outrageous to say that technology has indirectly transformed the study of language and restored weight to areas within it (mathematical, logical) which an earlier philological tradition could not furnish" ["The relation of lit. to lang.," Times Literary Supplement, 25 May 1973, p. 594, Col. 3]. The cassettes and computer program provide the students learning opportunities which could not be duplicated in the classroom

Although a growing number of reports on the use of computers in language programs have been published, most language teachers have not used nor even seen a computer terminal. That is the position in which I found myself when it was agreed to try out the German program at Duluth; the experiment to be worthwhile needed an uninitiated instructor. A quick description of the computer component seems in order. The program is located in a state owned CDC 6400 in St. Paul and is accessed by telephone, so the program as such is invisible to the student. All he sees when he comes to study at the CRT is a standard typewriter keyboard with a few extra keys and a television screen on top of it. With the development of a multi-language typing element at the University of Minnesota in 1974, the student may now use a standard teletype terminal instead of the CRT. After dialing a telephone number to connect with the program, what he types, appears on the screen or the print-out sheet; there greetings, text, commands and corrections from the computer also appear.

Simplicity of use is the beauty of the computer element; the student's efforts are not wasted on learning technology, nor is he distracted by the computer from his purpose, learning German grammar at his own pace. There are other plus characteristics: work is checked and corrected immediately; the computer tutor is available at any time unlike a human teacher; the student may stop at any place

he wishes and continue from that point, or he may choose to review anything he has forgotten; he may skip ahead in the program after demonstrating with a few correct answers that he can handle a given problem. In other words, the computer is an ever available, somewhat personal, ever patient tutor for some aspects of language learning.

In one regard it is an unrelenting taskmaster--students must spell and punctuate according to convention. Any language teacher appreciates not having to waste valuable class time and boring correction time on orthography and punctuation. Another advantage of CALI is obvious, but easily overlooked. Each student in a classroom can respond personally to only a fraction of the drill examples, but with the computer he can do each drill under supervision albeit without the oral help an instructor would give. (What human teacher could patiently tutor every student on each example?) As a consequence, the amount of class time devoted to drill, usually about 40%--60%, can be reduced.

The computer program presents the instructor with another, often neglected, advantage--diagnosis of learning problems. Errors commonly made by the class as a whole or by an individual can be quickly spotted. The instructor then knows what needs to be reviewed in class sessions. Common errors in the program have another value; poorly developed drills and materials can be dumped immediately from the program and substitute entries made if necessary. A continual revision of the materials becomes possible. At Minnesota the textbook is printed in revised form annually, but individual instructors enter substitute materials at will into the computer program.

The pluses of the well developed CALI course point up something important. The most common complaints about programmed learning--it does not allow for individual differences; students are bored when they have to go through material they already know; neither reinforcement nor evaluation is immediate--are no longer problems.

The drills of Programmed German are the standard substitution and cue transformations. In the former, a full sentence is presented in German, then one element in English appears below the sentence. The student is to type a new sentence incorporating the German equivalent of the English item and any necessary structural changes. If he errs the accurate part of his answer remains, and he is directed by blanks to correct the rest. Should he fail to give an acceptable answer after several attempts, the full sentence is printed out for him, and he receives a new base sentence to work on. A student who fails to generate a satisfactory sentence five times in a row is branched back to an earlier explanatory drill. Cue transformations are similar to substitutions in format; the base sentence is followed by a German word, e.g., wenn, indicating a transformation in the sentence such as word order or mood.

Since, our initial involvement in 1972, lessons worthy of note have been learned in both technology and teaching. As one who is still an outsider in the world of the computer, I have shied from jargon but now must try to state what has been learned:

1) Communication costs for distant users of sophisticated CAI programs housed at larger computer centers need not be prohibitive if there are sufficient users to share a dedicated line. For example, at Duluth the departments of sociology, chemistry and language all cooperate in using the same WATS telephone line to the Twin Cities. Several CAI uses of long-distance lines have been successful, particularly the PLATO project in Illinois. Such time-sharing arrangements as the MERITSS telephone system in the State of Minnesota are examples of what can be done. Control Data Corporation's recent announcement of a plan for large-scale manufacturing and marketing of the PLATO system is encouraging evidence that the cost barrier may be broken. Control Data will also establish computer centers on each U.S. coast to lessen communication costs; to cultivate the development of materials, royalties will be paid authors of software similar to the royalties available to textbook authors. More success stories are necessary if CAI, or more accurately computer-supplemented instruction (CSI) is to become a widespread tool for accelerating and enriching student learning. As the Carnegie report noted in 1972, after nearly thirty years of computers on campus, only 4.5% of all college students had had contact with them. Not much has happened to change that basic fact since.

2) The cost per student instructional hour decreases with more users, obviously; but this in turn makes it economically responsible for states, institutions and commercial computer companies to dedicate telephone lines exclusively to CAI/CSI and academic research. WATS lines need not be exclusively used by academia for bookkeeping, research and business purposes!

3) More experimentation with dedicated lines might prove an alternative to solving the computer interface problem. (There is not enough standardization in the field to bring programs easily from one installation to another.) CAI/CSI programs need not always be transferred if they can be accessed at a distance with reduced communication costs.

4) So far CAI/CSI has remained a cottage industry with professors reinventing the wheel at neighboring institutions. Our experience shows that a well designed, full-length computer course can be employed nearly as easily as a textbook by an instructor far removed from the attention of the original course developer. Superior computer programs tried out simultaneously in several institutions might attract the attention of publishing firms which so far have shown little interest in the limited computer course market.

Parenthetically it should be mentioned that EDUCOM in 1975 approached 22 universities deeply involved in computer research and CAI with a proposal for a five-year project of co-operation. This points to a path out of the cottage-industry maze characteristic of the present scene. It also suggests future reduction of costs of computer-supplemented instruction--there could be greater numbers of users, and open competition should encourage improvement in the quality of the materials put on-line.

What we discovered in Duluth about language teaching and learning is intimated by the shift above from "computer-aided" to "computer-supplemented" instruction. While it may be true that students cannot be taught grammar and vocabulary but must learn these by themselves, instructors and students now agree that the need for class contact hours remains. However, this time should not be spent practicing drills, duplicating what the computer program does well. Students who work through the program have adequate grammar control and chide instructors for wasting class time on drill. What the first class suggested and what subsequent students have been getting is free discussion and use of the language, the chance to generate German with the aid of the teacher.

As a result of the success with the linear, programmed German course, two members of the department at Duluth have developed a complete universal Spanish program. It consists of a handbook and index (147 pages) to the nearly 10,000 drill items in the computer. Instructors are using the complete program for diagnostic, catch-up and individualized grammar instruction in beginning and intermediate Spanish courses. The advantages to this program are patent: 1) It can be used by any instructor or student on the MERITTS system in Minnesota, that includes many high schools and colleges. 2) Self-study, make-up work, contracting are possible for whole components of a standard Spanish program. 3) The number of drill items exceed by fivefold those in even the most extensive texts and so provide "personalized" tutoring and examples or drill items beyond the contents of the usual textbook or the imagination of the harried teacher in a classroom setting.

"Traditional" CALI program should not be tossed on the experimental trash heap though the urge is strong to do so by professors who soon tired of developments which no longer brought them acclaim, by critics of cost and by prophets of doom in the language teaching profession. While more individualized techniques, more refined programs such as those described in the next section of this paper need attention, what has been developed now requires craftsman-like attention and refinement. The current status of traditional CALI programs parallels the recent situation the much maligned audio-lingual method was in until the genius and perseverance of one professor John Rassias gave it new life in the now nationally acclaimed Dartmouth Language Method. CALI is in need of a "messiah," a Rassias.

PART II

In contrast to the comprehensive approach to CAI language training is a more individualized approach which is potentially more flexible; but it may, in turn be more demanding and force the teacher/author to face more difficult questions of effort and ultimate value. In brief, the teacher may take advantage of the computer by dealing with specific grammatical problems, one at a time, unrelated to anyone's scheme or text. This affords the obvious independence from such things as well as not having to work with materials that 'don't work' for a particular individual. Further, it allows both pedagogical flexibility, in that the order of presentation or use of materials may be altered at will; or in addition, the drills may be referred back to for specific review on a residual weakness. It also offers advantages with respect to the computer, as well. The degree of sophistication may be chosen to match the drill topic desired. Simple kinds of drills, such as vocabulary, plural formation, straightforward 'conjugational' drills of verbs only, can be programmed with simpler computer 'languages', while more complicated programs, such as generative CAI, can take advantage of systems allowing more capability, but having more inherent complexity. The biggest difficulty, and perhaps the most serious, is that the teacher himself must either learn one or more computer 'languages', or find someone who knows them, is willing to work, and preferably has some grounding in the target language (or as it is known in computerese, the 'natural' language under study). Thus, development time will be longer, and overall costs, including the time of the author, could be considerably higher than with a cuing system. Nonetheless, increasing familiarity with the capabilities of the machine can and does lead to increasing degrees of sophistication in programs, since designing each program is in itself a learning experience for the programmer or designer, and in turn tends to produce ideas for additional programs. Sophistication, in computer framework, must mean increasing degree of knowledge of the exploitation of the powers of the machine itself.

Some examples, drawn from the historical experience of this author, will demonstrate these points.

One may begin by designing simple vocabulary programs. For this, given the goal of the program, let us say, drilling definitions, one can learn enough of the BASIC programming language, one, it should be mentioned, very commonly found in the academic environment, in a few days, to get going. Once one realizes that if the computer is programmed to request and 'recognize' input--let us say a word, or an article and word typed by the student--and only input, then any response except the item with which the input is matched is wrong. At this level, the computer does not have to be 'told' the wrong answer; the student can be given the correct answer, told to type it, and be held at that place in the program until he types it. In all cases, the reinforcement factor of learning is

a prime feature of any CAI program, because it is very simple to keep the student in a place until he types in the correct answer. An example of this sort of program is found in the New Jersey Educational Computer Network three-star library under SPIEL1 (also running in French, Spanish and Latin under the names JEU1, JUEGO1 and LUDUS 1). The program simply consists of between two and three hundred anytonym pairs (i.e. 'schwarz/weiss, der Tag/ die Nacht', etc.). One item of the word pair is presented to the student at random, and since all items have a numerical value to the computer (i.e., item 1, item 2, item 3, etc.), the program 'knows' that if an odd-numbered item is selected and displayed, the even-numbered item is the 'correct' answer, and vice-versa. For the sake of sweetening the learning pill, the program is run in the form of a game, with ratings from 'student' through 'oberdummkopf' to 'Lehrer' (for a perfect score). Part of a sample interaction would look something like the following.

```
                . . .
                . . .
COMPUTER:       warm
                ?
COMPUTER:       kuehl
COMPUTER:       gut!!
COMPUTER:       froh
                ?
STUDENT:        unfroh
COMPUTER:       die antwort ist: traurig--type it please
                . . .
                . . .
COMPUTER:       you have gotten less than seven correct
                on the first part
                go home and try again
                a u f
                w i e d e r s e h e n
```

If the teacher is willing to expend more time, other computer languages offer a higher degree of both sophistication and tailoring of material. An example would be the COURSEWRITER III system of IBM, a computer language designed for use in a question-and-answer environment. The major strength of Coursewriter, is its ability to deal with parts of words, and to have a built-in strategy for dealing with anticipated wrong answers. Thus, if all one cares about is making sure that the ending on a verb is '-st', the student will be made to type a whole drill sentence, but all the computer will 'look for' is the character string '-st'. Obviously, one must exercise some caution in writing material in this manner. Nonetheless, the following interaction of a live program run of the 'GPREP2' will demonstrate the power of the machine in Coursewriter. The program itself is designed to drill the two-way prepositions. By using

approximately 50 basic words (i.e. 7 subjects, 14 verbs each of motion and non-motion, the prepositions, the numbers and a large number of objects, all semantically compatible, several hundred thousand combinations of sentences are possible. What really counts is the relationship between the verb and the prepositional phrase. Part of a sample interaction is as follows. (The student is expected to enter the whole sentence, filling in the blanks, in this case, with the preposition and articles.)

COMPUTER:	Onkel Sigmund schlaeft ... ... baeckerei ... scheune (between)
STUDENT:	Onkel Sigmund schlaeft hinter dem baeckerei und das scheune
COMPUTER:	The preposition is wrong 'between' = 'zwischen' - try again
STUDENT:	Unkel Sigmund schlaeft zwischen dem backerei und das scheune
COMPUTER	gender of the f i r s t noun is wrong. gender and case of the it is : fem S e c o n d noun wrong article is : . .der . . try again
STUDENT:	Unkel Sigmund schlaeft zwischen das baeckerei und der scheune
COMPUTER:	The gender and case of the f i r s t noun are wrong. The article is: der. . try again
STUDENT:	Onkle Sigmund schlaeft zwischen der baeckerei
COMPUTER:	you have spelled the following wrong: onkle . . . try again
STUDENT:	Onkel Sigmund schlaeft zwischen der baeckerei und der scheune

Other computer language systems offer still more range for the imagination and time of the instructor. The APL system ('A Programming Language'), affords the instructor the ability to 'drill' entire paragraphs, in what is known as 'controlled composition.' The student is given a paragraph, either written for the occasion, or taken from some public source. The student is then told to write the paragraph as though it happened yesterday (i.e. transformation into the past tense), or as though it is being told by him and his brother (i.e., transformation into plural number). In the latter case, especially, changes in addition to the verbs must be made, and thus the student is, in effect, writing in a context and making appropriate operations at a higher level than the pattern drill. An experimental APL program that will accept whole paragraphs, ignore spelling errors outside of the critical points, feed back to the student locations of errors and the correct answer, and, in addition, keep a complete record of all transactions for the instructor exists as GCOMP.

In sum, while the computer as a tool for language teaching can't 'do everything', for instance translate freely, it can be made to tailor drills to specific problems, and continue tirelessly to challenge the student. The only limitation is the imagination of the programmer or the programmer/instructor. How much 'computer learning' should be attempted by the instructor, how much time and effort should be put into the matter is something which individuals themselves must decide. In many cases, getting together with a programmer is enough to get some things done, but the true breakthroughs into drill sophistication will eventually come from the teacher who does do some 'hands-on', since his perspective is pedagogical from the start, and he must in the end tailor his material to fully exploit the capabilities of the machine. While this may seem to present a forbidding task for a humanist, it is not so difficult: if one can learn Mittelhochdeutsch or Gothic, as most of us have had to, not to mention Latin or French, BASIC or APL are no more than additional languages, and with respect to syntax and size, relatively limited ones at that.